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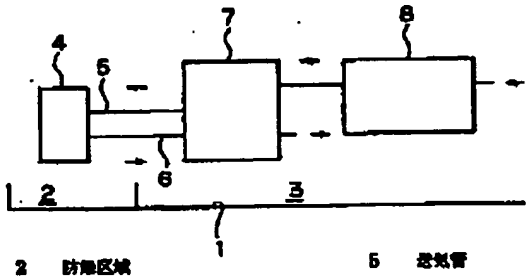
(54)【発明の名称】　防爆型方位測定装置

(57)【要約】

【目的】　測定装置を収装した防爆容器の温度上昇を防止して、防爆区域における方位測定の自動化を可能にする。

【構成】　方位検出機構を内圧防爆構造の容器4に密封して防爆区域2内に配置し、この容器4に送気管5と排気管6とを接続する。送気管5に送風する送風機15と排気管6の開口部とを非防爆区域に設け、送風機5による送風を冷却する冷却機構16を備える。



2 防爆区域　5 送気管
3 非防爆区域　6 排気管
4 内圧防爆容器　8 送風冷却装置

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【特許請求の範囲】

【請求項1】 方位検出機構を内圧防爆構造の容器に密封して防爆区域内に配置し、この内圧防爆構造容器に送気管と排気管とを接続し、送気管に送風する送風機と排気管の開口部とを非防爆区域に設けるとともに、送風機による送風を冷却する冷却機構を備えたことを特徴とする防爆型方位測定装置。

【発明の詳細な説明】

【0001】

【産業上の利用分野】本発明は、可燃性ガスの発生の恐れのあるトンネルなど、防爆区域において方位測定装置を使用する場合の防爆手段に関する。

【0002】

【従来の技術】可燃性ガスの発生の恐れのあるトンネル内部などの防爆区域において方位を測定する場合には電気を使用するジャイロコンパスは爆発や引火の恐れがあるために使用できず、従来は手動式の測量器具を用いて行っていた。

【0003】

【発明の課題】しかしながら、近年ではトンネル施工の自動化やロボット化の要求が大きく、そのためにジャイロコンパスなどを用いて方位を自動的かつ連続的に測量する必要があった。

【0004】防爆区域であってもジャイロコンパスを密閉した防爆容器に収納すれば使用することは一応可能であるが、その場合にはジャイロコンパスの発生熱により防爆容器内の温度が上昇し、ジャイロコンパスの動作に支障を来す恐れがあった。

【0005】本発明は、上記問題点に鑑みて、測定装置を収装した防爆容器の温度上昇を防止して、防爆区域における方位測定の自動化を可能にすることを目的とする。

【0006】

【課題を達成するための手段】本発明は、方位検出機構を内圧防爆構造の容器に密封して防爆区域内に配置し、この内圧防爆構造容器に送気管と排気管とを接続し、送気管に送風する送風機と排気管の開口部とを非防爆区域に設けるとともに、送風機による送風を冷却する冷却機構を備えている。

【0007】

【作用】送風機と冷却機構により送気管に送られた冷気は、内圧防爆構造容器内を通って排気管開口部から非防爆区域内に排出される。この冷気が内圧防爆構造容器内の方位検出機構を冷却し、方位検出機構の発生熱を非防爆区域に放出する。

【0008】

【実施例】図1～図3に本発明の実施例を示す。

【0009】図1はトンネル1の内部の概略の区分を示し、切羽付近に防爆区域2が設定され、後方に非防爆区域3が設けられている。

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【0010】防爆区域2には切羽を掘削しながら前進する図示されないシールド掘進機が配設され、方位検出機構としてジャイロコンパスが内圧防爆構造の容器4に密封した状態でこのシールド掘進機に取り付けられる。

【0011】容器4にはトンネル1に沿って配設された送気管5と排気管6が接続される。送気管5と排気管6は後方の非防爆区域3内に配置された監視装置7に接続される。この監視装置7はシールド掘進機に連結して非防爆区域3内に位置する図示されない台車に搭載される。

【0012】監視装置7には図2に示すように送気管5に送風冷却装置8を接続する送気口15と、送気流量を調節するバルブ9と、送気バルブ9の流量を計測して表示する流量計10と、非防爆区域3内に開口する排気管6の排気口11と、排気管6の流量を調整する排気バルブ12とが設けられる。

【0013】送風冷却装置8は図3に示すようにエアーフィルタ14、ブロワ（送風機）15、空気冷却機16及びエアータンク17を直列に接続したものである。

【0014】空気冷却機16は二重構造のパイプの内管の内側にブロワ15からの送風を通し、内管と外管の間に冷却水を導いたものであり、外管には調整バルブを備えた冷却水の入口20Aと出口20Bが設けられる。

【0015】エアータンク17は冷却された空気を一次的に貯留するものであり、内部に結露して溜った水分を放出するドレーン21を備える。

【0016】このように構成された送風冷却装置8は監視装置7とともに非防爆区域3内の台車に搭載される。

【0017】また、図に示すように容器4の排気管6の接続部には圧力計13が取り付けられ、この検出圧力を表示する表示部13Aが監視装置7に設けられる。

【0018】14は内圧防爆容器4内の圧力が何らかの理由で一定以上に上昇した時に、ジャイロコンパスの電源を切断する圧力スイッチである。

【0019】次に作用を説明する。

【0020】ジャイロコンパスを使用する際は送気口15に接続した送風冷却装置8を運転することにより、送気バルブ9を介して送気管5から容器4内に冷却空気を送り込み、同時に容器4内の空気を排気管6により非防爆区域3内に排出する。

【0021】容器4内の空気の圧力と温度は送気バルブ9と排気バルブ12の開度調節及び空気冷却機16の冷却水流量の調整により制御される。

【0022】すなわち、送気バルブ9と排気バルブ12を大きく開くことにより容器4内を通過する空気の流量が増加し、容器4内のジャイロコンパスの発生熱が大量の排出空気によって非防爆区域3に盛んに放出されることから容器4の温度が低下する。また、空気冷却機16の冷却水の流量の増減により送風温度が調整される。

【0023】このようにして、送気バルブ9と排気バル

ブ１２及びの操作により容器４内はジャイロコンパスの動作に適した温度と、外気を上回るほぼ一定した圧力とに維持される。したがって、ジャイロコンパスは十分な防爆条件のもとで安定的に動作し、防爆区域２における方位測定を安全かつ自動的に行うことができる。

【００２４】なお、防爆区域２はシールド掘進機の前進とともに前方へと移り、後方の非防爆区域３がこれに合わせて前方へ拡大するが、容器４がシールド掘進機に、監視装置７と送風冷却装置８がシールド掘進機の後方に連結された台車上にそれぞれ搭載されているため、これらは掘進作業の進捗とともに移動し、ジャイロコンパスは連続的に方位を検出し続ける。

【００２５】

【発明の効果】以上のように本発明は、防爆区域に方位検出機構を格納した内圧防爆構造の容器を配置し、この容器に送、排気管を接続し、送気管に送風する送風機と排気管の開口部とを非防爆区域に配置するとともに、送風機による送風を冷却する冷却機構を備えたので、送風機と冷却機構により送気管を介して容器内に送られた冷気が方位検出機構を冷却し、方位検出機構の発生熱を非

防爆区域に放出して容器内の温度上昇を防止する。

【００２６】したがって、防爆区域内においてもジャイロコンパスなどの方位検出機構を使用して方位を自動的かつ連続的に検出するすることが可能となる。

【図面の簡単な説明】

【図１】本発明の実施例の配置を示す掘削中のトンネル内部の概略縦断面図である。

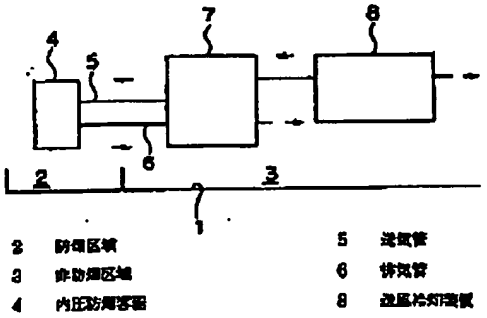
【図２】空気の流れを説明する防爆型方位測定装置の概略構成図である。

【図３】送風冷却装置の構成を示すブロック図である。

【符号の説明】

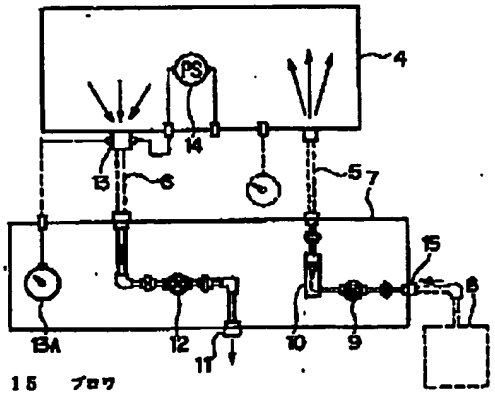
２　防爆区域
３　非防爆区域
４　容器
５　送気管
６　排気管
８　送風冷却装置
１５　ブロワ
１６　空気冷却機

【図１】



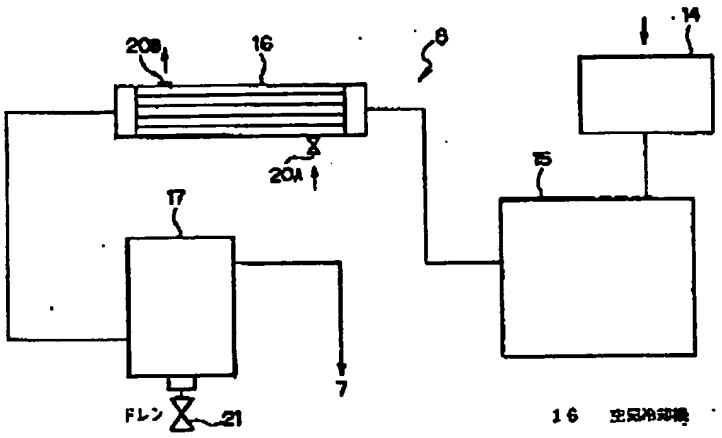
２　防爆区域
３　非防爆区域
４　内圧防爆容器
５　送気管
６　排気管
８　送風冷却装置

【図２】



１５　ブロワ

【図3】



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(71)Applicant : DAINIPPON DOBOKU KK

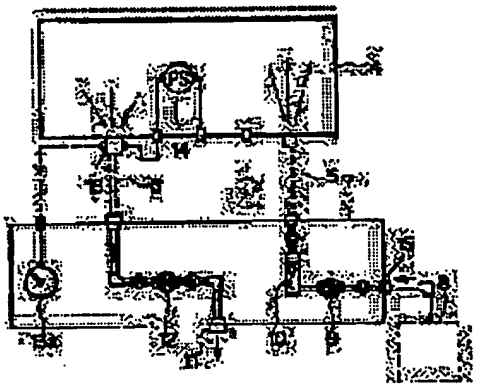
(72)Inventor : FUTAI MUTSUHIRO

(54) EXPLOSION-PROOF AZIMUTH MEASURING DEVICE

(57)Abstract:

PURPOSE: To automate the measurement of an azimuth by cooling an azimuth detecting mechanism in an internal pressure explosion-proof structure container with the use of cold air, and by radiating heat generated from the azimuth detecting mechanism into an antiexplosion area.

CONSTITUTION: During use of a gyro compass, a blasting and cooling device 8 is driven so as to feed air from an intake-air pipe 5 into a container 4 through an air feed pipe 9, and simultaneously, air is vented from the container 4 into an antiexplosion area through a vent pipe 6. By largely opening an air feed valve 9 and a vent valve 12, the flow rate of air passing through the container 4 is increased so that the heat of the gyro compass in the container 4 is radiated into the antiexplosion area by a large volume of vent air so that the temperature of the container 4 is lowered. Further, the temperature of fed air is adjusted by increasing the decreasing the flow rate of cooling water passing through an air cooler. Thus, the gyro compass may be stably operated under a sufficient explosion condition, thereby it is possible to safely and automatically measure an azimuth in an explosion-proof area.



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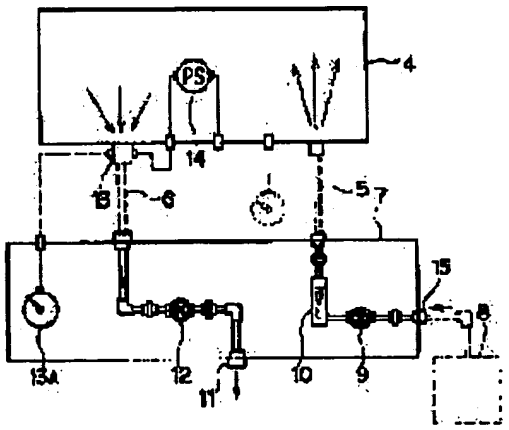

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CLAIMS

[Claim(s)]
[Claim 1] The explosion-proof type bearing measuring device characterized by having the cooler style which cools the ventilation by the blower while preparing the blower which seals a bearing detection device in the container of an internal pressure explosion-proof construction, arranges in an explosion-proof area, connects an airpipe and an exhaust pipe to this internal pressure explosion-proof construction container, and ventilates an airpipe, and opening of an exhaust pipe in the non-explosion protection area.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to the explosion-proof means in the case of using a bearing measuring device in explosion-proof areas, such as a tunnel with fear of generating of inflammable gas.
[0002]
[Description of the Prior Art] When bearing was measured in explosion-proof areas, such as the interior of the tunnel with fear of generating of inflammable gas, since there was fear of explosion or ignition, the gyrocompass which uses the electrical and electric equipment could not be used, but was conventionally performed using the survey instrument of manual system.
[0003]
[Problem(s) to be Solved by the Invention] However, in recent years, the demand of automation of tunnel construction or robotization was large, therefore needed to survey bearing automatically and continuously using the gyrocompass etc.
[0004] Although it was possible once to have used it if it contains in the explosion-proof container which sealed the gyrocompass even if it is an explosion-proof area, the temperature in an explosion-proof container rose with the generating heat of a gyrocompass in that case, and there was a possibility of causing trouble to actuation of a gyrocompass.
[0005] This invention prevents the temperature rise of the explosion-proof container which installed the measuring device inside in view of the above-mentioned trouble, and aims at enabling automation of the bearing measurement in an explosion-proof area.
[0006]
[Means for Achieving the Goal] This invention sealed the bearing detection device in the container of an internal pressure explosion-proof construction, has arranged it in an explosion-proof area, connected the airpipe and the exhaust pipe to this internal pressure explosion-proof construction container, and it is equipped with the cooler style which cools the ventilation by the blower while it prepares the blower which ventilates an airpipe, and opening of an exhaust pipe in a non-explosion protection area.
[0007]
[Function] The cold sent to the airpipe by the blower and the cooler style is discharged in a non-explosion protection area from exhaust pipe opening through the inside of an internal pressure explosion-proof construction container. This cold cools the bearing detection device in an internal pressure explosion-proof construction container, and emits the generating heat of a bearing detection device to a non-explosion protection area.
[0008]
[Example] The example of this invention is shown in drawing 1 - drawing 3 .
[0009] Drawing 1 shows the partition of the outline inside tunnel 1, the explosion-proof area 2 is set up near working face, and the non-explosion protection area 3 is formed back.
[0010] The shield machine which moves forward while excavating working face in the explosion-proof

area 2 and which is not illustrated is arranged, and a gyrocompass is attached in this shield machine as a bearing detection device in the condition of having sealed in the container 4 of an internal pressure explosion-proof construction.

[0011] The airpipe 5 and exhaust pipe 6 which were arranged along the tunnel 1 are connected to a container 4. An airpipe 5 and an exhaust pipe 6 are connected to the supervisory equipment 7 arranged in the back non-explosion protection area 3. This supervisory equipment 7 is carried in the truck which connects with a shield machine and is located in the non-explosion protection area 3 and which is not illustrated.

[0012] As shown in supervisory equipment 7 at drawing 2 , the exhaust port 11 of the exhaust pipe 6 which carries out opening to the supplied-air opening 15 which connects the ventilation cooling system 8 to an airpipe 5, the bulb 9 which adjusts a supplied-air flow rate, and the flowmeter 10 which measures and displays the flow rate of the supplied-air bulb 9 into the non-explosion protection area 3, and the exhaust air bulb 12 which adjusts the flow rate of an exhaust pipe 6 are formed.

[0013] The ventilation cooling system 8 connects an air filter 14, a blower (blower) 15, an air cooling machine 16, and an air tank 17 to a serial, as shown in drawing 3 .

[0014] An air cooling machine 16 leads cooling water for the ventilation from a blower 15 between through, an inner tube, and an outer tube inside the inner tube of the pipe of dual structure, and inlet-port 20A and outlet 20B of cooling water equipped with the modulating valve are prepared in an outer tube.

[0015] An air tank 17 stores the cooled air in primary, and is equipped with the drain 21 which emits the moisture with which the interior was dewed and covered.

[0016] Thus, the constituted ventilation cooling system 8 is carried in the truck in the non-explosion protection area 3 with supervisory equipment 7.

[0017] Moreover, as shown in drawing, a pressure gage 13 is attached in the connection of the exhaust pipe 6 of a container 4, and display 13A which displays this detection pressure is prepared in supervisory equipment 7.

[0018] 14 is a pressure switch from which the power source of a gyrocompass is disconnected, when the pressure in a pressurized enclosure 4 rises by a certain reason more than fixed.

[0019] Next, an operation is explained.

[0020] In case a gyrocompass is used, by operating the ventilation cooling system 8 linked to the supplied-air opening 15, cooling air is sent in in a container 4 from an inlet pipe 5 through the supplied-air bulb 9, and the air in a container 4 is discharged in the non-explosion protection area 3 with an exhaust pipe 6 to coincidence.

[0021] The pressure and temperature of air in a container 4 are controlled by opening accommodation of the supplied-air bulb 9 and the exhaust air bulb 12, and adjustment of the cooling water flow rate of an air cooling machine 16.

[0022] That is, the flow rate of the air which passes through the inside of a container 4 by opening greatly the supplied-air bulb 9 and the exhaust air bulb 12 increases, and since the generating heat of the gyrocompass in a container 4 is briskly emitted to the non-explosion protection area 3 by a lot of discharge air, the temperature of a container 4 falls. Moreover, ventilation temperature is adjusted by the change in the flow rate of the cooling water of an air cooling machine 16.

[0023] Thus, the inside of a container 4 is maintained by the temperature suitable for actuation of a gyrocompass, and the mostly fixed pressure exceeding the open air by the supplied-air bulb 9 and actuation which reaches exhaust air bulb 12. Therefore, a gyrocompass can operate stably under sufficient explosion-proof conditions, and can give insurance and an automatic target bearing measurement in the explosion-proof area 2.

[0024] These move with progress of an advancing activity and in addition, as for a gyrocompass, detecting bearing, since it is carried, respectively on the truck with which the container 4 was connected with the shield machine and supervisory equipment 7 and the ventilation cooling system 8 were connected behind the shield machine although it moves from the explosion-proof area 2 to the front with advance of a shield machine and the back non-explosion protection area 3 is expanded to the front according to this is continued continuously.

[0025]
[Effect of the Invention] As mentioned above, while this invention arranges the container of the internal pressure explosion-proof construction which stored the bearing detection device in the explosion-proof area and arranging the blower which connects ** and an exhaust pipe to this container, and ventilates an airpipe, and opening of an exhaust pipe to a non-explosion protection area Since it had the cooler style which cools the ventilation by the blower, the cold sent by the blower and the cooler style in the container through the airpipe cools a bearing detection device, the generating heat of a bearing detection device is emitted to a non-explosion protection area, and the temperature rise in a container is prevented.

[0026] Therefore, it becomes possible to detect bearing automatically and continuously in an explosion-proof area using bearing detection devices, such as a gyrocompass.

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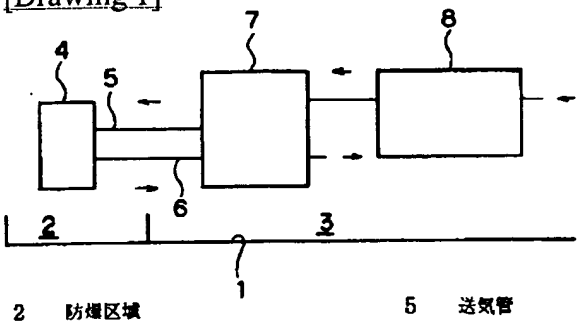
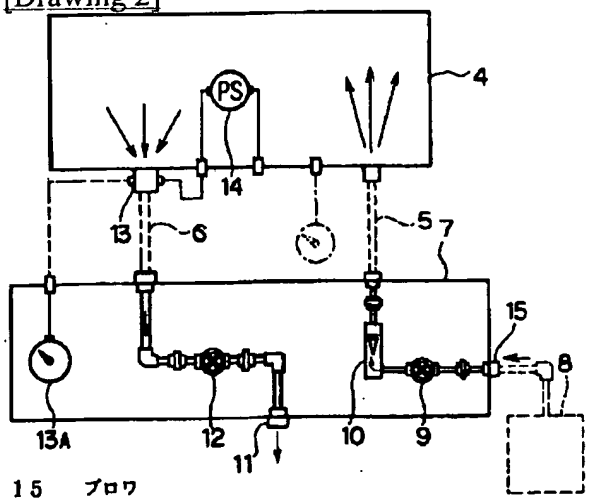
DRAWINGS

[Drawing 1]



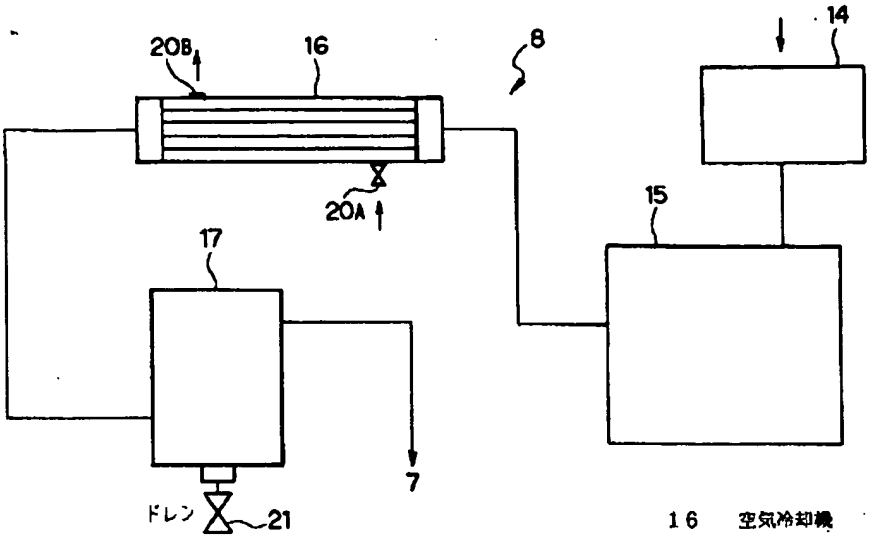
2 防爆区域
3 非防爆区域
4 内圧防爆容器
5 送気管
6 排気管
8 送風冷却装置

[Drawing 2]



15 ブロワ

[Drawing 3]



[Translation done.]